REMARKS

This Amendment, submitted in response to the Office Action dated January 15, 2003, is believed to be fully responsive to each point of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

Claims 1-15 remain pending in the application. Claims 1-6, 8 and 11-12 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Mizuuchi et al. (U.S.P. 5,506,722, hereafter "Mizuuchi '722"). Claims 7 and 9-10 have been rejected under 35 U.S.C. § 103 as being unpatentable over Mizuuchi '722 in view of Mizuuchi et al. (U.S.P. 5,652,674, hereafter "Mizuuchi '674"). Claims 13-15 have been rejected under 35 U.S.C. § 103 as being unpatentable over Mizuuchi '722 in view of Nightingale et al. (U.S.P. 6,151,342, hereafter "Nightingale"). Applicant submits the following arguments in traversal of the prior art rejections.

Applicant's invention relates to a semiconductor laser module and method of fabrication. Conventional laser modules include an excitation laser having a fundamental frequency and propagating in a first mode and an optical conversion part which generates a second harmonic of the fundamental frequency, and which propagates light in a second mode. Due to the inclusion of different mode types (TE and TM) of the laser and the converter, the conventional structure cannot efficiently generate the second harmonic. The beam patterns of the laser and the converter also differ, further contributing to inefficient conversion. For example, the polarization direction of the converter is in a direction P perpendicular to a substrate surface of the converter element.

Applicant's invention, illustrated in relevant part in Fig. 1, overcomes the above deficiencies. An optical waveguide conversion element 14 propagates in a TE mode and has a polarization direction which is parallel to the substrate surface. Similarly, the laser source 12 outputs light having a TE mode and a polarization direction parallel to the substrate. Moreover, the laser source is adjustable to control a center wavelength of the stimulated emission. Adjustment of the center wavelength permits stimulated emission to be phase matched with the wavelength of the conversion element to maximize the conversion efficiency.

Turning to the cited art, Mizuuchi '722 relates to a wavelength conversion element. Significantly, the light entering the conversion element is fixed to a certain wavelength, such that the wavelength is not tunable. Mizuuchi '722 col. 28, lines 23-27; col. 29, lines 52-55; col. 31, lines 16-20.

Mizuuchi '674 also relates to a wavelength conversion device and primarily relates to formation of periodic domain reversals. The exemplary embodiment superposes a pulse voltage onto an electric field by applying electrodes to the +C and –C planar surfaces of a ferroelectric substrate. Col. 13, lines 54-61.

Nightingale relates to a light source including a plurality of diode lasers and cooling elements to reduce the heat generated by the plurality of diode lasers. Referring, for example, to Fig. 6, diode lasers 22 are mounted via respective islands 44 to a heat sink material 41. The front face of the diode 24 is disposed to face a waveguide 50 which outputs light at a common aperture 56.

The Examiner maintains that Mizuuchi '722 teaches each feature of independent claims 1 and 12. However, each of the independent claims describe a laser source which can adjust a center wavelength of the laser beam. The Examiner has not indicated where Mizuuchi teaches the tunability described by these claims. Applicant further argues that Mizuuchi '722 clearly describes a fixed wavelength output of the light source, and thus the wavelength is not tunable as described by independent claims 1 and 12. See Mizuuchi '722 at col. 28, lines 23-27; col. 29, lines 52-55; col. 31, lines 16-20. Therefore, the independent claims are not anticipated.

With regard to claim 2, this claim describes that the spontaneous polarization of the substrate forms an angle with a surface of the substrate. The Examiner generally relies on cols. 7-15 and Figs. 5-9 to describe these features of the invention. Applicant would submit that Fig. 5 illustrates a substrate having a –Z plane defining a top surface thereof, and the direction Y defines a direction of propagation. The direction of spontaneous polarization +C is coextensive with a planar surface of the substrate such that there is no angle (zero) between the surface of the substrate and the direction of spontaneous polarization. To the extent that there is a declination in the polarization angle, the angle is defined between an inverted polarization domain and the spontaneous polarization direction. The angles discussed in Mizuuchi '722 correspond to angles of a different aspect than that described by claim 2. Claim 12 is patentable for this additional reason.

Moreover, at cols. 7-15 and Figs. 5-9 of Mizuuchi '722, the direction perpendicular to the substrate surface is -X direction. The substrate surface includes C (Z) direction and Y direction. The propagation direction of the wave is approximately +Y direction because propagation direction is slightly angled by θ from +Y direction within the substrate surface. C direction is

within the substrate surface, and there is no angle between the spontaneous polarization direction and the substrate surface. On the other hand, the subject invention teaches that there is an angle between the spontaneous polarization direction and the substrate surface.

Claims 3-6 are further patentable for describing a particular angle between the surface of the substrate and direction of spontaneous polarization.

For the foregoing reasons, Applicant would submit that claims 1-6, 8 and 11-12 are not anticipated.

With further regard to claims 7 and 9-10, the Examiner relies on the combination of Mizuuchi '722 and Mizuuchi '674. Applicant would submit that Mizuuchi '674 does not make up for the deficiency of Mizuuchi '722 with regard to the tunability of the laser device. This is because Mizuuchi '674 is directed towards formation of the domain reversals in the converter and does not address the light source in any significant way.

With further regard to claims 9-10, these claims describe a silicon material disposed between the laser and the converting element. To the extent Mizuuchi '674 teaches a silicon material, it is disposed as an insulator on top of a comb-shaped electrode of the converting element. The silicon is not disposed between the laser and the converting element as claimed.

Moreover, Applicant would submit that one skilled in the art would not combine the features of Mizuuchi '722 and Mizuuchi '674. Mizuuchi '722 specifically defines a converting element whereby the +C axis orientation is inclined to the substrate surface rather than normal thereto. See Mizuuchi '722 Fig. 5 and col. 7, line 65 to col. 8, line 4. In direct contrast, Mizuuchi '674 relates to a substrate defined by a +C surface, having electrodes for domain

reversals applied to the electrodes. In this connection, Mizuuchi '674 merely teaches the prior art described in Mizuuchi '722, which Mizuuchi '722 criticizes for poor efficiency. See col. 4, line 4 to col. 5, line 17. Therefore, the references teach away from their combination with each other.

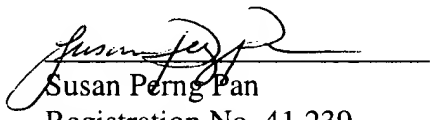
With further regard to claims 13-15, the Examiner cites the combination of Mizuuchi '722 and Nightingale. However, Nightingale fails to make up for the deficiencies of the primary reference. Moreover, the combination of Mizuuchi '722 and Nightingale does not teach each feature of claim 13. The claim describes placing a laser and converting element on a substrate having a stepped portion. The Examiner concedes that Mizuuchi '722 fails to teach this aspect of the invention but cites Nightingale to make up for this deficiency. However, to the extent Nightingale teaches stepped structures, the structures co-exist in a light source and do not describe the relationship between a light source and conversion element. Therefore, claim 13 is patentable for this additional reason. Claims 14-15 are patentable based on their dependency.

Applicant has added claims 16-19 to describe features of the invention more particularly.

In view of the above, Applicant submits that claims 1-19 are in condition for allowance. Therefore it is respectfully requested that the subject application be passed to issue at the earliest possible time. The Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 16-19 are added as new claims.